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AUTHOR Johnson, Carole; And Others
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ABSTRACT

One of a series of papers on critical issues in vocational-technical education, this paper presents an overview of (1) manpower supply and demand factors, (2) techniques for geographic allocation of resources, and (3) strategies for curricular prioritization and determination as they relate to program planning for vocational education. Emphasis is on the components needed for correlating vocational education with present and future labor market trends, four specific methods of demand forecasting, the ingredients of supply analysis, and the utilization of job satisfaction data as related to labor supply and demand. (HD)

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PRIORITY PLANNING PIERCES THE PERSONPOWER PUZZLE: FACING THE FACTS IN FORECASTING

Written and presented

by

Carole Johnson

Contributors:

Nancy Fried
Marianne D'Onofrio

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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OBJECTIVES

The presenter will:

-provide an overview of the components needed for correlating vocational education with present and future labor market trends;

-introduce four methods of demand forecasting;

-describe ingredients of supply analysis;

-describe the utilization of job satisfaction data as related to labor supply and demand; and

-evaluate the method of presentation.

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INTRODUCTION

In the process of program determination administrators frequently find themselves engulfed in a maze of labor market trend data which is often derived from a multitude of sources. The program planner must be able to unscramble this information so that it can be viewed systematically. Although the applied techniques may vary, a systematic assimilation of information is appropriate for all levels of vocational administration.

This paper approaches program determination and prioritization from a methodological perspective. It was felt that in order to be an intelligent consumer of program development data, it is necessary to understand some of the techniques used to derive that data. It was further felt that one should have an awareness of some of the inherent advantages and disadvantages associated with each technique.

This awareness may enable the consumer to discern the congruency of a given technique with the context in which it has been implemented. Therefore, the scope of this paper attempts to present an overview of: 1) manpower supply and demand factors; 2) techniques for geographic allocation of resources; and 3) strategies for curricular prioritization and determination as they relate to program planning for vocational education.

In planning vocational programs, viewing the relationship between local manpower needs and national manpower concerns should be considered. Rapidly increasing rates of mobility and economic pressures mandate an interrelated perspective. (Venn, 1964; Hauser) Program planners must realize that with high present and projected mobility rates, students must be equipped for employment in areas outside the immediate community. State, regional, and national labor market trends, as well as local demands, should be considered at all levels of planning. Significant national trends should be examined and understood in terms of future effects upon local demand and in terms of preparing students capable of vocationally successful migration. (Weinrich & Weinrich)

Certain trends are now apparent. These include a reduction of unskilled workers; a deviation from goods-oriented occupations to service and technically-oriented occupations; and increased numbers of working women. (Letch; Tennyson, et al; USDL, 1966; USDL, 1972) National trends such as these are likely to become evident in local communities, and awareness of them can enhance local planning and prioritization. (Weinrich & Weinrich)

In addition, comparisons of local trends with national growth or decline rates can aid in evaluating the reasonableness of local projections by acting as reference points for local forecasts and thereby aiding in the formulation of local decisions. (USDL, 1969, Vol I; Kidder) However, it should not be inferred that local planning should be based entirely upon national trends. Projection analysts should be aware that

wide discrepancies between local and national trends exist in some occupational areas. These discrepancies exist because of special conditions within the local community. National trend data is most valuable when local data is unavailable, incomplete, or is too aggregated. (USDL, Vol I, 1969) Such data is also useful when local occupational patterns do not differ significantly from national patterns. For example, restaurants, hotels, and banks may represent industries with such fairly consistent patterns. When such consistency is identified, local forecasting efforts can be redirected toward occupational areas with unique local patterns. (USDL, 1969, Vol I, II)

Acquisition and utilization of labor market trend data requires an analysis of manpower needs and supplies. Such an analysis is necessary whether one's philosophical base for vocational education is individually (student)-oriented or economically (society)-oriented. (Weinrich & Weinrich) For as Ahamad and Blaug point out, imbalances between labor market demand and supply affect both the society and the individual. Society is affected by restricted growth in the economy while the individual is affected by reduction in morale, earnings, and social status.

Manpower data must be gathered, analyzed and used to project 1-year and 5-year plans for vocational education in compliance with the Vocational Education Acts of 1963, 1968 and 1972. (Venn, 1969) This data gathering process can accrue several direct benefits for vocational education. For example, this data can aid in program development

planning, can provide useful information for vocational placement and career counseling, and can aid in the evaluation of program effectiveness. (Weinrich & Weinrich; Thompson; Ahamad & Blaug; Scoville; USDL; 1969, Vol I; McKinlay) In addition, the USDL asserts that if vocational programs and guidance accurately reflect changing labor market trends certain societal benefits can be accrued. For example, reduction of imbalances between labor market supply and demand, minimization of structural unemployment, increased worker productivity, and improved worker earning power can be achieved. (1969, Vol. I)

Forecasting is a technique used to analyze and project manpower demand and supply. When adequate forecasts are made, they CAN play a significant role in program planning. In addition to aiding in the development of program plans, forecasting compels organization members to think futuristically and may help to unify and coordinate planning. (Koontz and O'Donnel; Parnes)

Despite the potential benefits of forecasting, it is not universally accepted as a major contribution to educational planning. The primary concerns raised about forecasting involve the dangers of insufficient data, inaccurate data interpretation, and resulting misallocation of funds. (Young, et. al.; Robertson) According to Ahamad and Blaug, long-range (10-20 years) forecasts are affected by greater errors because of futuristic uncertainties and the compounding of errors over time, than are medium-range (3-5 year) or short-range (1-2 year) forecasts.

Therefore, long-range forecasts should be used primarily as broad indicators of future trends.

This is unfortunate since the "ideal" projection in terms of vocational education would be 10 years. An accurate 10-year projection would allow sufficient time for planning, constructing, and staffing programs and would give assurance of employment openings for an extended period after students leave the program. (Young, 1973)

Despite evidence that forecasting fails to achieve the desired accuracy levels it can still contribute positively to program planning. (Young, et al) Parnes feels that the risks involved in using forecasts "are preferable to making decisions about human resource development randomly." (p.63). However, certain factors should be kept in mind when using forecasts. First, use of expert forecasts is generally advisable since their results are usually more accurate than are amateur forecasts. (Young et. al.; Robertson) Secondly, "experience with forecasting and relevant data generation will improve the quality of forecasts" (Young et al, p.22). Thirdly, as Robertson points out, national level forecasts are usually more accurate than are local forecasts. However, local labor market data, if it is reasonably accurate and does not lead to planning, student enrollment, or demand overreactions, can be highly beneficial in terms of vocational education planning and guidance. (Young, et al)

The need for accuracy in forecasting for vocational education planning is determined largely by the levels of enrollment in vocational education programs and the percentage of the trained labor market it supplies. If real labor market demand is significantly greater than the forecasted demand and enrollment supply is small, precision in forecasting is not essential. However, if the forecasted demand is significantly greater than the actual demand and enrollment is excessive, severe problems arise. Young et al assert that developing and refining an acceptable forecasting system becomes critical when program expansion or revision is contemplated. In addition, the need for forecasting accuracy varies with the specificity of the program. The more specific the program the greater the need for forecasting accuracy. For example, greater accuracy would be required when contemplating the implementation of a word processing program than would be required to establish an IOE clerical program. (Young et al)

There are four primary forecasting techniques which have varying degrees of precision. These four techniques are:

1. Employer Surveys;
2. Extrapolation Techniques;
3. Econometric Techniques; and the
4. Job Vacancy-Occupational Outlook Approach.

(Young, et al; Robertson; Weinrich & Weinrich)

EMPLOYER SURVEYS

The Employer Survey is the forecasting technique most frequently utilized by local vocational education planners. The two primary types of employer surveys are "Area Skills Survey" and "Training Needs Survey." In conducting an area needs survey, local planners examine 50 to 150 occupations with generally the highest levels of local employment. The selected occupations usually require at least one year of training or more but less than a bachelor's degree. A random sample of employers is asked to define current employment rates and project two and five year employment needs. In addition, employers are asked to supply estimates of annual replacement needs and numbers of persons involved in on-the-job training. (Young, et al; Robertson; Weinrich & Weinrich; Burt)

Employer survey information is supplemented by estimates of projected supply, in addition to on-the-job training figures. Such sources of supply projections may include estimates of the number of persons expected to complete training programs other than vocational education. These alternate sources of supply include proprietary schools, apprenticeships, CETA, training institutes and the military. Data from the local employment service is also utilized. (Young, et al)

The state employment service is able to supply data concerning levels of employment, unemployment, underemployment, and job vacancies. Data concerning levels of employment and underemployment by geographical areas can be used to determine recent labor market problems and the

degree to which structural unemployment contributes to unemployment. Such data may be useful in determining geographic priorities in vocational education planning. (Young, 1973)

Caution, however, should be exercised when utilizing state employment service information data. Careful scrutiny should be applied to these figures since the major sources of this data are the mandatory reports from businesses covered by the state's unemployment compensation insurance program. It should be noted that governmental, agricultural, and non-profit organizations are not included in the data collection. Therefore, variations in the ratio between total unemployment and the insured unemployed may be substantial. (Young, 1973)

Some observers feel that this data is too crude to be utilized effectively for area prioritization. This is true regardless of adjustments made to include estimates of non-insured unemployed and related factors. (Young, 1973)

When employer surveys are used, supply and demand data are compared to arrive at an estimate of training needs for each occupational area covered in the survey. (Young, et al; Robertson, Weinrich & Weinrich) The training needs survey is a less sophisticated version of the area needs survey. Smaller non-randomly selected employer samples for fewer occupational areas with shorter projection times are used with the training needs survey. (Young et al; Robertson; Weinrich & Weinrich)

The use of these two survey techniques, for projection purposes has been criticized. These criticisms stem from the fact that numerous

employers have been indefinite sources of forecast data since many of them do not become involved in manpower planning. (Young et al) Local employers frequently do not perform detailed forecasting over extended periods of time using highly sophisticated techniques. (Scoville) Furthermore, fearing their competitor's acquisition of this information a large percentage of organizations are reluctant to disclose their projected manpower needs. (Young et al) In some instances these problems have been resolved through the help of local trade organizations. (Burt) For example, the manufacturers association of Erie, Pennsylvania provides one, three, and five year projections of the future labor market needs of its large membership to local vocational schools. (Guzzardi) However, it should be remembered that when purely localized data is used, labor migration factors are seldom considered. (Young, et al)

Although categorical use of employer surveys for projection purposes has been criticized, they can serve other useful functions for vocational education. Such surveys can provide a vehicle for developing communication channels between business, industry, and education systems. These allow employer input into local program planning and may lead to the identification of cooperative training sites. (Robertson; Weinrich & Weinrich) In addition, such surveys do provide information concerning a firm's plans for immediate expansion and production process alteration. (Young, et al)

The frequent use of employer surveys may be attributed to several factors. Surveys at the local educational agency level are relatively

inexpensive, easy to administer, and may be implemented quickly. (Young, et al; Robertson; Weinrich & Weinrich) Cost factors may become critical, however, when surveys are used on the state or regional level. (Harris)

EXTRAPOLATION

A second forecasting technique frequently used in vocational education planning is the "extrapolation method." This method uses past trends as a basis for determining future needs and is the most simplified forecasting technique. This method is inexpensive, efficient, and quickly implemented. (Young, et al; Robertson; Weinrich & Weinrich)

Since technological and employment patterns are known to change rapidly, the use of historical trends may be questioned in terms of predictive validity. (Weinrich & Weinrich) This use of past trends has been questioned as an adequate prognostication device in terms of human resource development and its extensive use has been given as one reason for current manpower problems. However, more research on the accuracy of this technique as compared to more expensive methods is needed. (Young et al)

ECONOMETRIC TECHNIQUES

A highly sophisticated forecast technique has been developed by the Bureau of Labor Statistics of the U.S. Department of Labor. This econometric technique involves the utilization of the National BLS Industrial/Occupational Matrix along with local population and economic

projections. (Young et al; Young 1973; Robertson; Weinrich & Weinrich; Maxim) The BLS technique provides a ten year projection base for industrial labor demand by occupation. The ten year projection time is used in an effort to provide adequate lead time for planning, constructing, and staffing education and training sites. (Young, et al; Young, 1973)

TOMMORROW'S MANPOWER NEEDS is the four volume publication developed by the BLS which describes the industrial/occupational matrix and methodologies for its use. Certain underlying assumptions are made by the BLS in describing the usefulness of these volumes. These assumptions are:

1) The reliability of state and area manpower requirements can be enhanced if the analyses are made within the context of national economic and technological developments.

2) Regional manpower analysts familiar with local markets, the movement of industries into and out of an area, and other factors affecting local industrial and occupational employment are best equipped to estimate manpower requirements at the local level.

3) Selection of an appropriate projection technique or mix of techniques should take into account the financial resources available to regional manpower analysts, the technical sophistication of the staff, the volume, purposes, and levels of detail and accuracy for the required projections, and the availability of computer assistance. (USDL, 1969, Vol. I)

The steps involved in developing forecasts through use of the BLS matrix technique have been summarized by Young as follows:

1. Projection of the population by age, sex, color, and geographical distribution.

2. Projection of the labor force by age, sex, color, educational level, and state.

3. Based on the assumption of minimal unemployment, an estimate is made concerning future levels of gross national product, based on trends in productivity, hours of work, and consumer expenditures.

4. These estimates of final demand are examined for their implications in terms of industrial output at both the final stage of production as well as among the intermediate and basic industries that provide the inputs to the final production process.

5. Given the final output expected from the various industrial sectors, estimates are made of the manpower or occupational structure within each industry required to produce that output.

6. These estimates of occupational employment by industry, based on the industry/occupational matrix, or the BLS matrix, may be summed to provide the total estimated employment by occupation.

7. In addition to changes in requirements as a result of growth or decline in occupational employment, estimates are made of those leaving the work force through withdrawal, death, and retirement. These two components of future occupational need -- growth and occupational losses -- are summed to provide the estimate of new openings for labor force entrants. Net interoccupational mobility is allowed for only roughly, due to the inadequacies of empirical data. (1973: 9-10)

STATE APPLICATION OF BLS MATRIX

Industry Division	1960			1975	
	State Independent Estimates[1]	State Based on National Matrix[2]	Ratio of A to B	State Based on National Matrix[3]	Adjusted State Projections (C & D)
	A	B	C	D	E
Total, all accountants	69,800	58,187		69,925	82,100
Agriculture	100	20	5,000	33	200
Mining	300	65	4,615	114	500
Construction	1,100	1,023	1,075	1,633	1,800
Manufacturing	14,400	11,313	1,273	11,548	14,700
Transportation and public utilities	4,800	3,897	1,232	3,898	4,800
Trade	6,400	6,214	1,030	6,254	6,400
Finance, insurance and real estate	8,700	6,492	1,340	5,596	7,500
Services	26,800	24,601	1,089	33,988	37,000
Public administration	7,200	4,562	1,578	5,861	9,200

[1] From table 13.

[2] The BLS industry-occupation matrix for 1960 applied to total jobs in New York State in each of 116 industries; e.g., there were 333,400 jobs in apparel in 1960 in New York State which when multiplied by 0.09% the percent that accounts are of apparel nationally as shown in the BLS matrix gives an estimate of 300 accountants. The number of accountants in each of the 116 industries were then added to obtain the 9 industry division totals shown in this column.

[3] Similar to column B using the 1975 BLS matrix and 1975 New York State total job projections.

Source: USDL Tomorrow's Manpower Needs, Washington DC: Bureau of Labor Statistics, 1969, Vol I,: 31.

State projections of employment by industry may be translated into estimates of state and local occupational employment estimates by following the steps outlined above. The BLS suggests two basic methods for utilizing the industrial/occupational matrix at the state or area level. The first involves computing a ratio of local employment wage and salary figures to national figures for previous years and extrapolating future needs through the use of a trend line. This method is advocated for use with industries having national distributions but not with industries having primarily local markets. (USDL, Vol. I)

A multiple regression technique is recommended when national and local industries do not show a close relationship. When using this method the analyst must have independent variables for which projections are available or can be developed. (USDL, 1969, Vol. I)

In addition, some states have found it necessary to modify these techniques and to use a number of supplementary sources. For example, one state uses the USDL series CURRENT EMPLOYMENT STATISTICS in combination with TOMMORROW'S MANPOWER NEEDS in an elaborate systems approach procedure. (Maxium)

Although the BLS matrix provides projections of new occupational openings, to be useful for vocational education planning the occupational categories given must, in some cases, be converted to correspond to the USOE Curricular Code for each occupation. (Young, et al; Young, 1973) The need for introducing instructional categories into the matrix has been a major criticism of this technique. (Kidder) Some educational

analysts have attempted to resolve this difficulty through the use of the DICTIONARY OF OCCUPATIONAL TITLES. In addition, current efforts by the USDL are underway to reconcile these descriptive differences. (Young; Young, et al)

Several problems have been identified in the use of the BLS matrix in addition to those mentioned previously. First, the assumption of consistency between present and future needs is questioned. Political and societal factors such as inflation and war cannot be foreseen and can have a dramatic impact upon national, state, and area labor market supply and demand. Secondly, questions are raised concerning the validity of estimating the rate of national technological change based upon estimates of sectional change. Thirdly, although educational attainment levels for each occupation listed are provided, the BLS matrix does not provide specific estimates of educational requirements for those occupations. It cannot be assumed that a certain educational attainment level is optimum simply because a majority of persons in that occupation have achieved that level of education. It is possible that current employees may be under-educated or over-educated for the occupations in which they are engaged. This problem is viewed by Young as one of the most serious deficiencies in all types of forecasting and is not restricted to the BLS matrix alone. (Young, et al) Econometric techniques have also been criticized on the basis of their cost (in terms of professional consultation services) and complexity (comprehension difficulty level). (Kidder)

However, when external consultation services are not needed the BLS matrix approach, especially on the state level, is viewed as very economical. (Harris)

The use of an econometric technique does have advantages in addition to those previously described. A wide range of projections based upon differing supply and demand assumptions may be made through use of this technique. This fact may be particularly significant in areas in which industries are changing rapidly or where employment levels are largely dependent upon factors which are difficult to predict (for example, areas dependent upon national defense contracts or federal construction projects). (USDL, 1969, Vol. I) In addition, the Advisory Committee on Research to the U.S. Employment Service recommends that the BLS matrix approach replace the area skill survey for projection purposes in vocational planning. (Young, et al)

Research in the application of the BLS matrix for state and local utilization is continuing. Such research has already led to the development of occupational forecasts for states based upon national data, by the U.S. Training and Employment Service. (Young, et al) In addition, the BLS has begun to develop a greatly expanded matrix encompassing much greater occupational detail through its Occupational Employment Statistics Program. This effort has initially involved twenty six states and includes a massive survey of manufacturing, non-manufacturing and agriculture industries. (Young, 1973) Furthermore, at least forty states are currently preparing or have completed projections based upon varied

adaptations of the BLS matrix methodology. (Young, 1973)

JOB VACANCY-OCCUPATIONAL OUTLOOK APPROACH

Job vacancy data (derived from employment service surveys or Job Bank data, or other employment service sources) coupled with trend information provided in the Occupational Outlook Handbook has been recommended for use when high degrees of forecasting accuracy are not necessary. Such a situation could exist when labor market demand rates are high but education and training resources are so limited that only a fraction of the needed supply can be provided. (Young, et al) There are two forms of job vacancy data. One form of job vacancy data is developed from the number of recruits sought by employers through the employment service. The other is determined by surveying sampled insured unemployment compensation establishments. Manufacturing job vacancies, for example, are determined through occupation samples on a quarterly or annual basis. (Young, 1973) This data, derived by either method, indicates the total number of job openings.

The total number of job openings over time are then compared with jobs designated as "hard to fill". (Young, 1973) "Hard to fill" jobs are defined as those job openings which have been listed with the employment service for thirty days or more. These calculations determine classification of jobs as persistent vacancies. Such persisting vacancies are then listed in descending order, compared with national trends through the OCCUPATIONAL OUTLOOK HANDBOOK or the BLS matrix,

and investigated to determine reasons for vacancy persistence. National trend data is used to provide context information. (Young, et al) The reasons for these job vacancies are categorized according to low wages, parsity of qualified potential employees, poor working conditions and other. (Robertson) These reasons may indicate lack of responsiveness by training institutions or unattractiveness of the positions to qualified workers. (Young, et al)

The validity of equating labor demand with job vacancies has been viewed skeptically. This skepticism is based upon the fact that "vacancy rates" vary according to recruitment and processing time and because a vacancy may be claimed by an employer seeking to replace a current employee with a better qualified worker. (Kidder)

A number of other criticisms have also been leveled at this forecasting technique. First, no distinctions are made between permanent and temporary vacancies. (Dunlop; Young et al) Second, as Dunlop points out, the job vacancy approach does not examine self-employed workers or the relationship of entry level jobs to the internal labor market. Internal labor market factors (i.e., promotion from within) may not be apparent since entry level hiring standards may be higher than would be expected from an examination of the job vacancy/matrix. Thus, basing training practices entirely on entry level skills may hinder the individual's potential employment or promotability. (Young, et al)

Employment and/or job vacancy surveys typically exclude self-employment as a source of job opportunities. Self-employment and small

bussinesses with twenty or fewer employees comprise significant portions of the labor market especially for those engaged in trade, agriculture, and construction occupations. The extent to which these small enterprises contribute to the state's economy varies.(Dunlop) For example, in Mississippi a large number of welders are self-employed or work in small one to five man shops. The magnitude of sheer numbers of those so engaged and the fact that they may be located in sparsely populated areas leads to the problems of identification and contact, making employer surveys unrealistic. In addition, few of these employers conduct demand forecasts or use employment service resources. Census data must be relied upon to determine the numbers of persons so employed. This situation is probably not the case in highly industrialized states like Ohio and Michigan.

Thirdly, undesignated critical vacancies may exist which once filled would lead to the employment of other persons. Fourthly, vacancies may exist which are redundant for competitor's seeking to move into a given market. The filling of a position in one firm may eliminate that need by another firm, as when businesses are competing for the same contract. (Young, et al)

Fifthly, when the number of vacancies are due to relatively low levels of wages offered, to use the vacancy data as an index for training priority would tend to maintain relatively low wages through the provision of an expanded labor supply. It must be recognized however, that "all training tends to increase labor supply and thus suppress wages."

(Young, et al: 34) Finally, although vacancies may be listed, on-the-job training may be taking place to alleviate the shortages. In such a case it would not be necessary to establish a formal training program. (Young, et al)

Despite these criticisms the job vacancy/matrix does have advantages as a forecasting technique. First, it does consider the flow of supply since if no persistent openings exist demand is assumed to be met. This demand may be being met through local training, in-migration, or internal supply. (Young, et al) Secondly, the job-vacancy approach is a very inexpensive forecasting technique especially when compared to area skill surveys. Such surveys may "cost from $20,000 to $100,000", depending on the size of the community and scope of the survey. (Young, et al: 34) While the job-opening matrix approach implemented in a city the size of New York would cost approximately $2,000." (Young, et al:34) Thirdly, this approach is relatively specific in terms of job and educational code and is based upon local area data. (Young, et al) Fourthly, in terms of measuring job opportunities and projecting future openings the job vacancy approach may be most beneficial for local manpower planning, if used in conjunction with other manpower data sources. (Young, et al) Fifthly, federal and state employment service Job Bank data, job orders and surveys provide a measure of job openings for industries frequently using the employment service for job recruitment. Use of this data is supported by "strong evidence that the occupational mix of employment service job orders is representative of labor market

transactions and that the employment service is the source of more and better information on what is happening in the labor market than any other single source". (Mangum and Snedeker: 160) Finally the acquisition of job vacancy data can be most beneficial for vocational counseling and placement. Such counseling can indicate to youth the occupational choices which will provide the best opportunities for future employment in the local community. (Levine)

The forecasting techniques described above are seldom used in their "purest" form. Users typically combine various aspects of these methods to achieve a system which best suits their needs. For example, the Ohio Division of Vocational Education uses the econometric industry/occupation technique suggested by the Bureau of Labor Statistics and then supplements the derived matrix with employer survey data acquired by the state employment service through its annual regional surveys. Further input comes from surveys of state trade associations; public and private sources of vocational training other than vocational education; and follow-up data on vocational education graduates. (Ohio State Plan for Vocational Education Revised 1975) Oklahoma through its Occupational Training Information System (OTIS) ascertains demand through extensive employer surveys conducted by the state employment service. Supply information is derived through their student accounting information system. (Morton) Pennsylvania uses the Bureau of Labor Statistics trend line method for matrix development supplemented by supply data such as that derived from a program-to-occupation matrix

for vocational graduates. (Senier and Franchak) Kansas initially utilized employer surveys but has shifted to a modified BLS matrix approach. Employment service records and surveys, Dun and Bradstreet market identifiers (R), plus state based studies are used supplementally. (Harris)

The discussion of forecasting techniques above primarily focused upon the demand aspects of vocational planning. However, some mention was made of supply factors as they relate to each technique. As McLoone points out, "...the interactions of supply and demand are difficult to separate and most projections are a mixture of both". (p.51)

The role of labor market supply, both current and expected, is significant in terms of correlating the provision of vocational education programs with present and future labor market trends. Supply should be viewed in terms of immediate and long-term needs. This perspective makes supply an integral part of planning for vocational education. Manpower may be viewed as derived from two basic sources -- internal and external supply. Internal supply has impact on external supply. Internal supply is concerned with the manpower available from within an organization while external supply is concerned with those sources of supply outside the organization, such as vocational education. (Yaney)

Internal supply affects the access of external sources of supply to jobs in several ways. First, collective bargaining and employer decisions affect the job classifications through which persons may

enter the organization. Second, hiring practices within an organization may primarily be concerned with generalized abilities for internal mobility. A list of jobs and their training requirements may not correspond to the limited number of ports of entry. Thus, until persons within an organization are promoted or relocated ports of entry remain closed to external sources of supply. Job vacancy data, therefore, may not be the best information upon which to base training decisions in the external market. In addition, although a company may report a job vacancy they may attempt to fill that slot with an existing employee. Reasons for attempting to use internal supply may be for improving employee morale, shorter job training time required, and lack of recruiting costs. (Yaney)

In addition to considering the impact of internal supply on ports of entry, labor mobility must also be examined. Mobility includes potential, threatened and actual movement between and within occupations, geographic regions, companies, and positions. (Lester) All these forms of mobility are relevant to vocational education planners since they "impact upon the supply of labor" and influence both horizontal and vertical movement within occupations. (Young, et al:54)

Decisions regarding mobility patterns effect the scope of vocational programs. Planning directed towards high mobility rates may be more generalized than those emphasizing limited mobility (i.e., students will remain in the local community). Therefore, vocational training may promote or dissuade occupational mobility. (Lester, Young, et al)

The local labor market outlook may be a determiner of the degree to which training emphasizes mobility. For example, areas which have a large number of "high wage openings" in their local job market may prefer to emphasize local opportunities and relate the skills students acquire to that specific locale. However, areas with less promising employment opportunities may emphasize state, regional, or perhaps national employment possibilities and provide more generalized skill training. (Young, et al)

Supply mobility is affected by providing individuals with accurate manpower information through career counseling, by the types of education and training programs provided, referral to jobs in accordance with abilities and projected needs ... and "wage benefit levels that encourage needed shifts between industries and occupations." (Lester:135)

Three methods for analyzing supply factors will be considered. These three methods are:

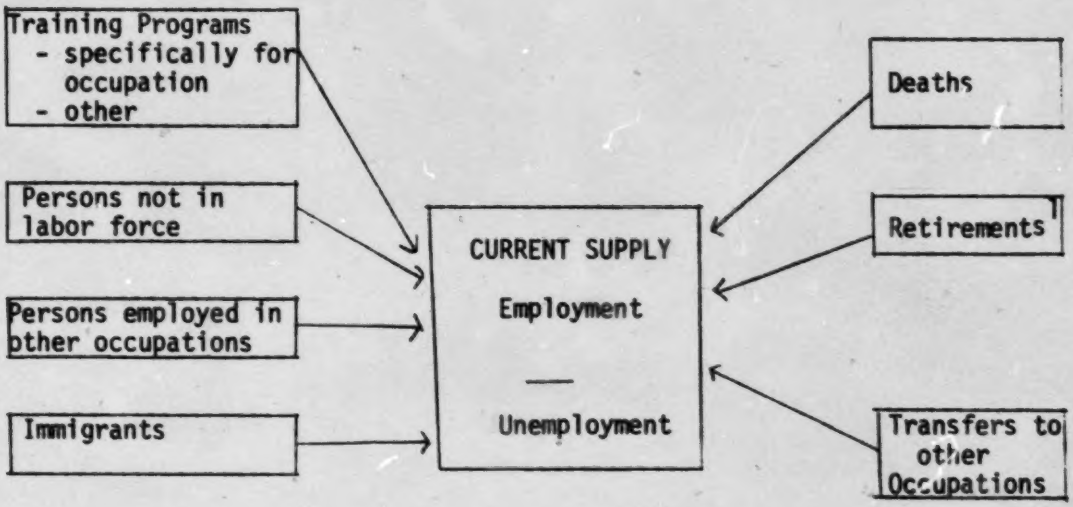
. the matrix approach;

. the population cohort model; and

. the adjusted manpower demand method.

The first method for examining supply factors requires the creation of a matrix similar to the one developed for employment by industry and occupation. (Mangum and Snedeker) The USDL has developed this technique for projecting supply. This technique involves three steps. First, an estimate of current supply is established as a base for the projection. Second, entrants into the occupation area from all sources of supply

THE STREAM OF MANPOWER INTO AND OUT OF AN OCCUPATION



[1] Includes all workers who leave the civilian labor force or who emigrate.

USDL: Tomorrow's Manpower Needs, Washington D.C.: Bureau of Labor Statistics, 1969, Volume I: 60.

are summed annually for the projection period. Third, the current supply base "is aggregated with estimates of the annual number of entrants and occupational losses are deducted." (USDL, 1969, Vol I:60)

Current supply is defined as the sum of the employed and unemployed in a given occupation. Entrants to an occupation are not necessarily employed. With this in mind, current supply then is determined for each occupation by summing the number of entrants and the number of losses. Entrants to an occupation include those from all types of training programs (including those who were trained specifically for the occupation and those who were not), persons entering from outside the labor force, persons changing occupations and immigrants. Occupational losses refer to those who leave an occupation due to transfers to other occupations, retirement, or death.

Current supply is not the same as potential supply. Potential supply is extraordinarily difficult to estimate since it includes "all workers who could perform the type of work regardless of their decision to work in another occupation or not to work at all." (USDL, 1969, Vol I:61) Since most people possess more than one skill, circumstances and opportunities frequently dictate which occupation they will enter. This is especially true of occupations with relatively low skill requirements. Thus this multiplicity of skills means that there usually are more persons qualified for various occupations than the number of persons actually employed in those occupations. Decisions to enter or leave an occupation are based upon a number of economic and personal

factors. Thus, the actual labor force in a given occupation must be viewed as "elastic to some extent" (USDL, 1969, Vol I:61)

Employment inducements such as increased salary and fringe benefits may cause qualified workers to enter an occupation while decrements or lack of increments may lead to the reverse. Likewise, employment inducements may increase when demand is high and supply is low; remain stable when demand and supply are relatively equal; and decrease when demand is low and supply is high. Thus, knowledge of demand projections are necessary for developing supply projections. (USDL, 1969, Vol I; Mangum and Snedeker)

Occupational losses each year are estimated "at about 3 percent of all workers." (USDL, 1969, Vol III:4) This rate varies according to the occupation considered. Age and sex heavily influence this loss rate. For example, occupations employing large numbers of young women have a higher loss rate than do those having large numbers of middle aged men. (USDL, 1969, Vol III; Mangum and Snedeker)

This supply projection technique, based upon the concepts of current supply and occupational losses, is viewed as most appropriate for estimating employment in professional and technical occupations for which specific training is required. This limitation is due to the difficulty in securing adequate information regarding entrance into most occupations via various sources. For example, "quantitative estimates of the supply in an occupation such as typist are extremely difficult to obtain, as thousands of people learn how to type each year in schools or at home."

(USDL, 1969, Vol I:60)

A second method for supply analysis was developed by manpower planners in the Dallas and Fort Worth SMSA's. It involves a three step planning process. The first step involves projecting demand through the BLS matrix multiple regression technique discussed previously. The second step involves a supply analysis through a simple population cohort model which purports to "estimate potential labor market estimates by level of educational achievement." (Pikulinski and Hughes: 242) This cohort population model was selected because of the difficulty in determining total training output from various sources and the variation in entry level requirements of different employers. In the third step factors derived from the demand and supply analyses are then reviewed in light of historical trends and immigration population factors before programmatic decisions were made.

Copa has developed a third method for determining supply as a component in vocational education planning and decision making. This method is based upon an adjusted manpower demand figure. His model assumes the existence of an accurate manpower demand description. This manpower demand figure is used as a base from which supply from internal organization sources having no vocational education training and supply from non-public sources of training are subtracted. Positions vacated by internal mobility are then added to the demand figures. The resulting figure is referred to as the "adjusted manpower demand." Need for vocational programs is based upon this figure. Further analysis is

then undertaken to determine the locations for programs, the level at which they will be offered (i.e., high school or post-secondary), and any special methods which must be used to meet the needs of potential enrollees. Prioritization of the type of program to be offered at a specific location and level may be determined (1) solely on the basis of demand, (2) solely on the basis of interest, or (3) on the basis of both demand and interest. (Copa)

In addition, prior to program installation consideration should be given to the purposes enrollees or potential enrollees may have for seeking the training to be offered. Such reasons may include acquisition of entry level skills, upgrading skills, or "orientation/exploration." (Copa:17)

Each of the three methods for supply analysis outlined above mention the multiple paths to skill acquisition. The fact that workers acquire their skills through a number of paths must be remembered. (Mangum and Snedeker, USDL, 1969, Vol III) Such training methods

> "must be viewed carefully in analyzing a particular area's manpower situation. Employers in the designated area may prefer workers trained in a manner that differs from the methods generally used in other parts of the country. Therefore, in developing training programs for a given occupation or groups of related occupations, planners must consider all training methods already in effect for the occupations in the selected areas." (USDL, 1969, Vol III:5)

In addition, although these sources of training may present special problems to vocational planners in terms of identifying the numbers of persons supplied and in terms of the types and levels of training

provided, they must be examined. Such sources include apprenticeships, private training programs, military service and "manpower" programs. (Young et al)

Apprenticeship is one route through which skills may be acquired. The magnitude of the impact of this path upon total labor supply is difficult to determine. The reasons for this difficulty are two fold. First there is no universal agreement as to what constitutes an apprenticeship (i.e., is it a specified number of hours in training; is it the same as on-the-job training). Lack of accepted definition leads one to question the validity of self-reported information included in U.S. census data. Second, while some apprenticeships are registered with the U.S. Department of Labor, many are not registered. (Young et al) However, with regard to registered apprenticeship programs it is known that the magnitude of enrollment is declining. (Letch)

Apprenticeships have been criticized as "being excessively lengthy, nepotistic, weak in related theory instruction ... discriminatory to members of minority groups, and unduly conservative in terms of numbers trained." (Young et al:40) The advantages of apprenticeship training on the other hand include the fact that it ... "is a proven means of skill transmission, provides gradually increasing income to the trainee at no direct cost to the taxpayer, assures that the trainee will be provided instructors utilizing current production techniques, provides a market for the output of the student ... and may be considered the route to leadership amongst craftsmen." (Young et al:40)

The significance of apprenticeship data for a given geographical area to vocational education planning depends largely upon the nature of the occupation and the level of training contemplated. "...The significance of apprenticeship data is considerably less for secondary program planning than it is for post-secondary planning in certain occupational areas." (Young et al:42) Occupations which frequently utilize apprenticeships for training purposes include construction, machinist, and tool and die making. In some areas, secondary vocational education programs for these occupations could be considered pre-apprenticeship training. (Young et al)

Another path for skill acquisition is on-the-job training. This source of instruction is very prevalent. (Young et al) Three of the many forms of on-the-job training undertaken by industry include: training conducted through simulations on the job site without active involvement in production, formal training programs involving an instructor, laboratory, and curriculum, and informal training in which one employee instructs another. (Mangum and Snedeker)

The factors mentioned previously concerning internal labor market supply which directly relate to on-the-job training, cause difficulties for vocational education planners in terms of forecasting. For example, internal supply factors, like ports of entry into organizations, tend to obscure the portion of manpower requirements that may be expected to be met "through internal on-the-job training programs." (Young et al: 49)

Military service is a third path through which job skills may be acquired. However, there is no universal agreement as to the transferability of skills acquired through military service to civilian jobs. The highest degree of transferability is usually found among those persons trained in technical fields. Vocational education planners should give "considerable thought to military returnees (especially in terms of technical occupations) as a complementary source of skilled manpower flowing into anticipated future job openings. (Young et al:53)

Manpower programs comprise a fourth path to skill acquisition. These programs focus upon persons categorized as economically disadvantaged and are administered under the auspices of the U.S. Department of Labor. Two important points should be made concerning these programs. First according to Young et al: "to the extent that vocational education and the rest of the educational community do their jobs, many of the manpower programs will eventually become irrelevant" and second "until that day comes, those programs are a significant part of the relevant supply system to be considered by vocational education planners:."(p.61)

Private business and technical schools offer a fifth path for skill acquisition. These institutions enroll significant numbers of students. For example, in 1966 the enrollment in these types of programs was approximately one-third as large as the enrollment in public vocational education. (Young et al) One of the primary reasons for this large enrollment may be due to their flexibility in programming in terms

of time required for completion, hours in which courses may be taken, and prerequisite educational requirements.

Kidder states that a "lack of detailed supply information can lead to serious misestimates in the amounts of vocational education expansion or contraction required." (p.52) Supply misestimates may be due to gaps in the data available, techniques used to acquire the data, and the "demand orientation of many manpower forecasters." (Kidder p.53) Forecasters frequently assume that increased vocational education expenditures are required to meet demand irrespective of cost benefit analyses. Thus this social solution orientation to demand prevails over a private solution through which employers could alter technology. In addition, Kiddler states that "this demand orientation persists in the face of obvious supply problems that have dominated public thought in recent years: i.e. how to integrate groups of disadvantaged citizens into the work force; how to place so called 'unemployables' in productive and satisfying jobs. One senses that by implicit assumption, suppliers of labor, not demanders should be called on to adjust behavior." (p.53) Kidder illustrates his argument by drawing attention to the fact that although vocational planners state that their ultimate goal is based on student welfare, in practice the solution to demand factors "involves a lock-step march through a totally-integrated system into slots designed to eliminate shortages." (p.53)

Regardless of the techniques used, supply and demand analyses comprise only one portion of the information used in vocational program

planning and resource allocation. The extent to which "net openings", a figure derived by subtracting supply from demand, is significant in program planning is determined by the method used to identify curricular priorities and designate the level of resource allocation. These methods of prioritization should be consistent with the goals and objectives for which vocational education will be held accountable (state and/or local depending upon the level of planning). (Young et al) However, irrespective of the extent to which they will be utilized, net opening figures must be calculated for inclusion in state plans for vocational education.

On the state level geographic funding allocations for the local educational agencies to be served must be determined. These state level determinations are required to reflect (1) the relative ability of a district to pay, (2) manpower needs and opportunities, (3) vocational needs, and (4) excess costs, by the U.S. Office of Education. (Young et al) Examples of two methods of geographic distribution criteria are reflected in the State Plans from Mississippi and Ohio. The Mississippi criteria is based upon a state average weighted formula, while Ohio uses the State School Foundation Formula when applicable and an equal weighted criteria ranking formula when the state formula is not applicable. In the Mississippi formula the factors of manpower needs, vocational needs, ability to pay and relative costs are weighted 3, 5, 1, and 1 respectively. These weights are multiplied by the state average basic factor of 5 to arrive at a

state average weighted factor. The total of average weighted factors represents the percentage of average distribution of schools with the state weighted average being 50 percent. When applied to the local school the basic factors are ranked from 1 to 10 and multiplied by the weight of that factor to calculate the total weighted factors. The resulting computation is expressed in terms of deviation from the state average. The "weights assigned are expressed in terms of the relative importance of each factor to determination of vocational need." (Mississippi State Plan for Vocational Education, 1976: 61)

EXAMPLE OF A STATE AVERAGE WEIGHTED FORMULA

Selected factors 1 to 10
State average basic factor = 5
Local school factors expressed in terms of deviation from state average.
Weights assigned are expressed in terms of relative importance of each factor to determination of vocational need.

	Weight of Factors	Basic Factors	Weighted Factors
Manpower Needs	3	5	15
Vocational Needs	5	5	25
Ability to Pay	1	5	5
Relative Cost	1	5	5
		Total	50

50 divided by 4 = 12.5 State Average Weighted Factor
Average Reimbursement to Schools 50%
Thus 50% = a 12.5 Average Weighted Factor

Source: Mississippi State Plan for Vocational Education, Jackson, Mississippi; Mississippi State Department of Education, Division of Vocational Education, 1976, p. 61

EXAMPLE OF A LOCAL SCHOOL FORMULA
(any town high school)

	Basic Factors
Manpower Needs and Job Opportunities	4.6
Vocational Needs of People	5.8
Relative Ability to Pay	4.2
Relative Cost of Program	5.0

	Weight of Factors	Basic Factors	Weighted Factors
Manpower Needs & Job Opportunities	3	4.6	13.8
Vocational Needs of People	5	5.8	29.0
Relative Ability to Pay	1	4.2	4.2
Relative Cost of Program	1	5.0	5.0
		Total	52.0

State Average Weighted Factor 12.5
Local Average Weighted Factor "this school" 13.0
Thus 12.5 : 50% : : 13.0 : X%
X = 52%

Source: Mississippi State Plan for Vocational Education, Jackson, Mississippi; Mississippi State Department of Education, Division of Vocational Education 1976, p. 61

Ohio's equal weighted criteria ranking formula rank orders six criteria directly from high to low except for the criteria of relative ability to pay which is ranked inversely. Priority is "given annually to local educational agencies with the highest composite rank order." (Ohio State Plan for the Administration of Vocational Education, revised 1975 , p.31) The resulting rank orders for all districts are then divided into thirds with the highest third given top priority ("A"), middle third second highest priority ("B"), and the lowest third, third highest priority ("C").

THE OHIO GEOGRAPHIC PRIORITIZATION CRITERIA

Criteria	Ranking Method
Manpower Needs and Job Opportunities	Direct Rank High to Low
Rate of Unemployment	Direct Rank High to Low
Percent of Reported Unemployment that is Youth	Direct Rank High to Low
Number of Children from Low Income Families per Thousand	Direct Rank High to Low
Relative Ability to Provide Resources	Inverse Rank Low to High
Relative Costs of Programs, Services, and Activities	Direct Rank High to Low
Composite for each District	Direct Rank High to Low

Source: The Ohio State Plan for the Administration of Vocational Education, Revised 1975. Columbus, Ohio: Ohio State Department of Education, Division of Vocational Education, 1975, p. 31.

Once geographic allocations to the local educational agencies have been made state level planners must determine resource allocation to curricula within those areas. This reponsibility is "generally relegated to the local decision-makers." (Young et al: 124)

Curricular prioritization involves integrating into the planning process "the goals, objectives, and weights," against which the vocational system will be held accountable. (Young et al:131) One method for achieving this integration is through a matrix approach advocated by Young. Such a matrix combines net job openings with a number of other factors

to achieve a curricular priority index rank and priority order for secondary level programs. These additional factors include: student interest, academic performance, entry wage, seniority wage, job satisfaction, curricular cost and serving disadvantaged. These factors are ranked according to specific criteria and summed to arrive at the curricular priority index. The resulting index is then examined to determine its appropriateness first, for vocational education generally and second, for secondary level programming. (Young et al)

This matrix may be developed for the entire secondary program or "separate matrices may be calculated for each clientele grouping -- e.g. physically handicapped, retarded, very bright, etc." (Young et al: 135) In addition, a second matrix or series of matrices should be developed for post-secondary level programs. (Young et al) It may also be necessary to develop separate matrices for males and females. This may be necessary because traditional "female" occupations (health and secretarial) have traditionally not paid as well as [sic: traditional] male occupations and thus would come out with relatively low scores." (Young et al: 153) Thus a general matrix "may bias training resource allocation to 'male' occupations." (Young et al: 153)

The use of this matrix establishes the priority order for program funding, however, it does not indicate the level at which each program should be funded. To determine the magnitude of funding to be allocated to each program requires additional calculations. These calculations may be based upon one of the formulas suggested by Young et al. These

formulas may be classified as a "Training Related Placement Strategy" and a "Labor Market Success Strategy." (Young et al)

Both of these resource allocation strategies use the curricular priority matrix as a first step in their calculation. However, the weights attached to the various components of the matrix differ. For example, student interest is a major criteria in each strategy, but its impact on resource allocation varies. In the labor market success strategy student interest is used as the "enrollment ceiling, subject to some minimum degree of labor market success of the graduates." (Young et al: 141) While in the training related placement strategy the number of projected training related job openings would denote the enrollment ceiling except in cases where student interest is low in comparison to the number of job openings. If that is the case, student interest becomes the basis for the enrollment ceiling. However, with the training related placement strategy funding would be determined by "the order depicted by the curricular priority matrix and, as a maximum, to the extent determined by either net openings or student curricular interest, the latter being the ultimate constraint upon funding." (Young et al: 141)

The training related success strategy basically involves four steps. The first step requires forecasting the net openings for each relevant occupation according one of the projection techniques described earlier for both supply and demand. The second step requires the formulation of the curricular priority matrix and establishing the rank priority

order. The third step entails calculating first, the number of students necessary to fill net forecasted openings, second, the per student extra cost, and third, the total cost for each program. These costs are computed for all programs considered. (Young et al) The fourth step determines the number of programs to be funded by "working down the list of priorities until resources are exhausted." (Young et al: 151)

The labor market success strategy determines funding allocations through a two step method. The first step requires the development of a curricular priority matrix. When using the labor market success strategy matrix factors such as "follow-up wages and job satisfaction" are weighted more heavily than are net job openings. (Young et al: 152) The second step in the labor market success strategy is to allocate available resources "in accord with their ranking, number of interested students, and extracurricular cost per student." (Young et al: 153)

Young et al suggest that access priority be given to disadvantaged students regardless of the strategy of program prioritization used. Access priority means that disadvantaged students who wish to participate in vocational education programs and have the basic intellectual capability (despite possible achievement level deficits) be given enrollment priority. (Young et al: 155)

The labor market success strategy gives considerable attention to wage and job satisfaction factors as evidenced through program specific follow-up data. Wages are considered for a number of reasons. First, wages reflect the willingness of employers to induce employees into an

occupation. (Young, 1973) Second, large numbers of job openings may be due to low wages, thus the occupation may have poor drawing and retention power. (Young, 1973) Third, consideration should be given to wage level differentials between goods-oriented and service-oriented occupations (the former levels generally being considerably higher than the latter). (Lester) Fourth, wages may "be thought of as an index synthesizing the impact of the interaction of supply and demand upon the trainee's prospects for status, health, incentives, and economic security." (Young, 1973: 31) Finally, follow-up data reflecting changes in pay over time would consider the "vertical and horizontal mobility of graduates." (Young et al: 77) All of these points could affect the types of programs offered, the methods used, and size of enrollment. In addition, low wage factors may indicate that training is not warranted because of the low benefits accrued or that training may be most efficiently provided through on-the-job training where the increased incentives may cause an increase in internal supply without increasing subsidized training. (Young, 1973; Burt)

Job satisfaction is also given emphasis in the labor market success strategy. Such an emphasis is given for a number of reasons. First, job satisfaction information, acquired through follow-up studies, reflects "the employees' appraisals --- of the total terms and conditions offered to them and under which they must work." (Young, 1973: 32) Secondly, such data provides information concerning the non-economic benefits accrued through the nature of the work. (Young, 1973) Thirdly, if

vocational education is viewed as having an impact on the "...eventual socioeconomic status of students, then there is reason to believe that it affects their job satisfaction." (Young, 1973: 33) If this is true such information would be most useful to the vocational education planner.

Job satisfaction information "adds a useful dimension to program appraisal, principally because it adds the psychological to the economic dimension." (Young et al: 79) The inclusion of psychological factors like job satisfaction and student interest can help maintain a planning perspective which is systematic without being totally mechanistic.

CONCLUSION

Systematic planning provides a vehicle through which vocational administrators may allocate the limited financial resources available to the development of programs which meet the needs of society and the individual. Such planning involves identifying current and projected labor market trends, determining geographic allocation of state resources, and designating and funding local curricular priorities.

The procedures used to generate the data necessary for program determination involve a number of factors. These factors include demand forecasting, supply projections, allocation formulas, curricular priority matrices, and local program funding methods. As an intelligent consumer of program development data, it is important for the vocational educator to recognize some of the assets and limitations of these procedures. For example, the problem of future manpower projections is like a jigsaw puzzle in which many important pieces are missing, particularly when attempting to make such projections at the state or area level. However, a great many pieces can be put together and, with better data and improved techniques in the future, some of the missing pieces probably will be found. (USDL, 1969, Vol I)

In addition it should be recognized that the techniques described are not inflexible, but rather are frequently modified to fit the context in which they are used. These modifications are made in an attempt to make vocational education reflect the needs of the society and individuals affected at each planning level.

Bibliography

Ahamad, Bashir and Blaug, Mark, (eds.). The Practice of Manpower Forecasting: A Collection of Case Studies. San Francisco: Jossez-Bass Inc., 1973.

Burt, Samuel M. Industry and Vocational-Technical Education. New York: McGraw-Hill Book, 1967.

Copa, George, et. al., Individual Demand for Vocational Education: Structure and Determination. Minneapolis: Minnesota Research Coordinating Unit for Vocational Education, February, 1973.

Dunlop, John T. "Job Vacancy Measures and Economic Analysis" in National Bureau of Economic Research. The Measurement and Interpretation of Job Vacancies. New York: National Bureau of Economic Research, 1966.

Guzzardi, Walter Jr. "Education for the World of Work." Fortune Magazine October, 1975,

Harris, James L. "The Kansas Manpower Utilization System for Training (Manpower Demand Module)." in Management Information Systems for Vocational Education: A National Overview (Morgan, Robert L., Ballenger, William L. Lawrence, James E.S. eds) Raleigh: Center for Occupational Education, 1974.

Hauser, Phillip M. and Martin, Taitel. "The Changing Character of the General Population: Implications for Education" in The Emerging Role of State Education Departments with Specific Implications for Divisions of Vocational-Technical Education. (Dick C. Rice and Powell E. Toth, eds.) Columbus, Ohio. The Center for Vocational and Technical Education, Ohio State University, 1967.

Kidder, David E. Review and Synthesis of Research on Manpower Forecasting for Vocational-Technical Education. Columbus: The Center for Vocational and Technical Education, The Ohio State University, 1972.

Koontz, Harold and O'Donnell, Cyril Principles of Management: An Analysis of Managerial Functions New York: McGraw-Hill, 1968.

Lester, Richard A. Manpower Planning in a Free Society. Princeton, N.J.: Princeton University Press, 1966.

Letch, Leonard A. "The Changing Occupational Structure with Implications for Education," in The Emerging Role of State Education Departments with Specific Implications for Divisions of Vocational-Technical Education. (Rice, Dick C. and Powell, E. Toth, eds.). Columbus, Ohio: The Center for Vocational-Technical Education, The Ohio State University, 1967.

Levine, Louis. "The Role of Job Vacancy Data for an Active Manpower Policy" in National Bureau of Economic Research, The Measurement and Interpretation of Job Vacancies. New York: National Bureau of Economic Research, 1966.

Mangum, Garth "Work Power for the Seventies: Requirements for Talent, Knowledge, and Skills" in The Courage to Change: New Directions for Career Education. (Pucinski, Roman C. and Hirch, Sharlene P, eds.). Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Mangum, Garth and Snedeker, David. Manpower Planning for Local Labor Markets. Washington, D.C.: Olympus Publishing Company, 1974.

Maxim, D. et al., Job Demand Forecasting Program a Vocational Education Planning System for Local School Districts, Vol. VII, Philadelphia: Government Studies and Systems, June, 1973.

McLoone, Eugene P. "Projections of Changing Student Population," in The Emerging Role of State Education Department with Specific Implications for Divisions of Vocational-Technical Education. (Rice, Dick C. and Powell E. Toth, eds). Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1967.

McKinlay, Bruce The Manpower Information Clearinghouse. Eugene, Oregon: University of Oregon, 1975.

Mississippi State Plan for Vocational Education. Jackson, MS: Mississippi State Department of Education, Division of Vocational-Technical Education, 1976.

Morton, J.B. "Occupational Training Information Service (OTIS)" in Management Information Systems for Vocational Education: A National Overview. (Morgan, R.L., Ballenger, W.L., Lawrence, J.E.S. eds.). Raleigh: Center for Occupational Education, 1974.

Ohio State Plan for the Administration of Vocational Education. Columbus: Ohio State Department of Education, Division of Vocational Education, 1974.

Parnes, Herbert S. "Discussion of The Role of Forecasting in Planning Manpower Programs" in The Localization of Federal Manpower Planning. (Aronson, Robert L., ed.). New York: New York State School of Industrial and Labor Relations, 1973.

Pilulinski, Jerome R. and Hughes, Mark. "A Supply and Demand Approach to Labor Market Analysis: The Dallas and Fort Worth SMSA's in Handbook for Manpower Planners Part 2 (by Dani Emery, Ruth Kaplan, and Lynn O'Donnell), Washington, D.C.: U.S. Departments of Commerce and Labor, 1973.

Robertson, Marvin J. Utilizing Manpower Follow-Up Data: A Perspective for Local Vocational Education Planning. Columbus, Ohio: ERIC Clearinghouse for Vocational-Technical Education, The Center for Vocational and Technical Education, The Ohio State University, 1973.

Scoville, James G. "The Role of Forecasting in Planning Manpower Programs" in The Localization of Federal Manpower Planning (Aronson, Robert L., ed). New York: New York State School of Industrial and Labor Relations, 1973.

Senier, John and Franchak, Stephen J. "Manpower Forecasting in Pennsylvania" in Management Information Systems for Vocational Education: A National Overview (Robert L. Morgan, William L. Ballenger, John E S Lawrence, eds.). Raleigh: Center for Occupational Education, 1974.

Tennyson, W.W.; Soldahl, T.A.; Mueller, C. The Teachers Role in Career Development. Washington, D.C.: American Personnel and Guidance Association, 1965.

Thompson, John. F. Foundations of Vocational Education. Englewood Cliffs, N.J.: Prentice Hall, 1973.

U.S. Department of Labor. Manpower Report of the President: A Report on Manpower Requirements, Resources, Utilization, and Training. Washington, D.C.: U.S. Department of Labor, 1967.

U.S. Department of Labor. Manpower Report of the President: A Report on Manpower Requirements, Resources, Utilization and Training. Washington, D.C.: U.S. Department of Labor, 1973.

U.S. Department of Labor. Tomorrow's Manpower Needs. Vols. I-IV. Washington, D.C.: Bureau of Labor Statistics, 1969.

Venn, Grant "The Dynamics of Techology and Society: No Compromise With Ignorance." Office of Education, Washington, D.C.: Bureau of Adult, Vocational and Library Programs, 1969.

Venn Grant. Man, Education, and Work: Postsecondary Vocational and Technical Education. Washington: American Council on Education, 1964.

Wenrick, Ralph and Wenrick, William J. Leadership in the Administration of Vocational and Technical Education. Columbus, Ohio: Charles E. Merrill Publishing Company, 1974.

Yaney, Joseph P. Personnel Management: Reaching Organizational and Human Goals. Columbus, Ohio: Charles E. Merrill Publishing Company, 1975.

Young, Robert C; Clive, William V; and Miles, Benton E. Vocational Education Planning: Manpower, Priorities, and Dollars. Columbus, Ohio: The Center for Vocational-Technical Education, The Ohio State University, 1972.

Young, R.C. Manpower Demand: Information Guidelines for Educational, Vocational Education and Manpower Planning. Columbus: The Center for Vocational and Technical Education, The Ohio State University 1973.

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